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# Book Review of 'Acid Rain A Water Resources Issue for the 80's'

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16. ABSTRACT

This volume is a collection of papers dealing with a variety of topical areas associated with the study of the effects of acidic deposition on watersheds and water resources. Because this volume was published in 1983, most of the research that contributed to these papers was conducted in the early 1980s and thus is somewhat dated. For this reason, this volume is not useful as an index to the current state of the art in the topical fields presented. Its principal utility lies in presenting some interesting data from early phases of continuing projects(e.g. the Shenandoah Watershed Acidification Study by Shaffer and Galloway) and in providing a historical snapshot of some avenues of research early in the study of "acid rain" in the United States.

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# Books

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## Acid Rain: A Water Resources Issue for the 80's

Raymond Herrmann and A. Ivan Johnson (Eds.), American Water Resources Association, Bethesda, MD, iii + 83 pp., 1983, $3.00.

*Reviewed by M. Robbins Church*

This volume consists of 11 papers reprinted from the "Proceedings of the International Symposium on Hydrometeorology," which was sponsored by the American Water Resources Association in June 1982. The papers cover a wide range of topics associated with the study of acidic deposition (commonly called "acid rain") and its potential effects on various components of natural ecosystems.

In and of themselves, the individual papers are well done and authoritative on the selected topics. This is to be expected, given the quality of the authors of these individual papers: A good number of very well respected researchers are included here. As an attempt at an integrated volume, however, this work lacks much. There is very little continuity from one paper to another, nor is there any apparent attempt at a meaningful sequencing within the volume. In some cases, (e.g., "Effects of Ambient Concentrations of Air Pollutants on Vegetation Indigenous to the Blue Ridge Mountains of Virginia"), the relationship of the individual papers to the topic of acidic deposition as a "water resource issue for the 80's" is difficult to follow.

The introductory paper ("International Aspects of Acid Deposition") by E. B. Cowling (North Carolina State University, Raleigh) is a very interesting summary of the history of studies of acidic deposition and its effects. Cowling is truly an authority on this topic and has done a very good job of pulling together a wide range of historical materials. His paper moves from a review of the history of past studies into a discussion of a potential sequence of events that might lead to the determination and acceptance of a set of "target loadings" that could be expected to protect some critical portion of the aquatic resources of concern. He further touches upon the difficulties and challenges of understanding such a complex problem and dealing with it on a national and international scope. Unfortunately, Cowling seems to give the impression that the concensus on some target loading was, or was about to be, reached as a result of several independent studies, when, in fact, the intensity of debate and level of disagreement associated with the statements quoted in his article are not fully described. Another unfortunate aspect of this paper is its Figure 2, entitled "Regions of Canada and the United States where lakes and streams have been acidified by acid deposition". This figure is demonstrably erroneous in several ways. This is not as important, however, as the fact that such a misinterpretation is, or was, indicative of the uncertainties inherent in the study of the topic even at "the state of the art."

The second paper in the volume ("The U.S. National Acid Precipitation Assessment Program" by C. Bernabo, National Acid Precipitation Program, Washington, D.C., and R. Hermann, Colorado State University, Fort Collins) is a very clear and concise description of that undertaking. There have been a number of changes in the structure of this program(NAPAP) since this paper was written but not enough to detract from the accurate and informative description given in this paper. In fact, the broad research topics that served as the original focus for NAPAP still exist in a relatively unmodified form. Different levels of progress have been made on each one, and although they do not all receive equal attention or research funding, they still form the basis for the program in its current state.

The rest of the papers in this volume describe the results of scientific studies of various aspects of the effects of acidic deposition

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in the environment. These papers are of the type that are usually found in such journals as *Atmospheric Environment, Journal of Environmental Quality, Water, Air and Soil Pollution* or *Water Resources Research.*

B. J. Huebert et al. (Colorado College, Colorado Springs) ("Gas Phase and Precipitation Acidities in the Colorado Mountains") examine the sources of nitrate and nitric acid in precipitation in the Colorado Front Range and make a convincing case for the metropolitan areas of Denver and Boulder as the major sources. D. W. Hanson and S. A. Norton of University of Maine at Orono ("Spatial and Temporal Trends in the Chemistry of Atmospheric Deposition in New England") sampled organic litter of high altitude spruce/fir forests along a transect of deposition from Vermont up into Quebec and discussed the relative deposition to and leaching of metals from this horizon to surface waters. J. M. Melack et al., University of California, Santa Barbara ("Acid Precipitation and Buffer Capacity of Lakes in the Sierra Nevada, California"), provide one of the very first careful studies of the chemistry of precipitation and the chemistry of lakes in the east-central Sierra Nevada. P. W. Shaffer and J. N. Galloway, University of Virginia, Charlottesville ("Acid Precipitation: The Impact on Two Headwater Streams in Shenandoah National Park, Virginia") discuss the first 2 years of the continuing Shenandoah Watershed Acidification Study (SWAS) and focus on input/output budgets of the major ions for the two watersheds studied. M. D. Flora and P. C. Rosendahl of South Florida Research Center, Homestead, Fla. ("The Impact of Atmospheric Deposition on the Water Quality of Everglades National Park") discuss precipitation loading, the initial 14 months of sampling by the National Atmospheric Deposition Program (NADP) in the region, and potential effects of acidic deposition on the chemistry of Shark River Slough, the predominant freshwater flow system of Everglades National Park.

The next two papers, by A. H. Johnson et al., University of Pennsylvania, Philadelphia ("Red Spruce Dieback in Vermont and New Hampshire: Is Acid Precipitation a Contributing Stress?"), and by Skelly et al. of Pennsylvania State University, University Park ("Effects of Ambient Concentrations of Air Pollutants on Vegetation Indigenous to the Blue Ridge Mountains of Virginia") concern the potential effects of acidic deposition and other air pollutants (e.g., ozone) on vegetation. Although this is a very interesting and difficult subject and one that is receiving a much increased level of attention on the national scene, the inclusion of these papers in a volume entitled "A Water Resources Issue for the 80's" is difficult to reconcile, inasmuch as no linkages are made regarding potential effects on any surface waters as a result of effects on forest vegetation or soils.

In another paper devoted to the study of lakes of the Sierra Nevada, K. A. Tonnessen and J. Harte, Lawrence Berkeley Laboratory, Berkeley, Calif. ("Potential for Acid Precipitation Damage to Lakes of the Sierra Nevada, California") present a selected variety of results from some of their studies in that region. The last paper in the volume is by J. R. Stottlemyer of Michigan Technological University, Houghton, ("Variation in Ecosystem Sensitivity and Response to Anthropogenic Atmospheric Inputs, Upper Great Lakes Region"). In this paper, Stottlemeyer summarizes his research in the very interesting Lake Superior basin, a region of high spatial variability.

In summary, this volume is a collection of papers dealing with a variety of topical areas associated with the study of the effects of acidic deposition on watersheds and water resources. Because this volume was published in 1983, most of the research that contributed to these papers was conducted in the early 1980s and thus is somewhat dated. For this reason, this volume is not useful as an index to the current state of the art in the topical fields presented. Its principal utility lies in presenting some interesting data from early phases of continuing projects (e.g., the Shenandoah Watershed Acidification Study by Shaffer and Galloway) and in providing a historical snapshot of some avenues of research early in the study of "acid rain" in the United States.

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